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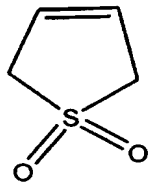
What is claimed is:

1. A photoresist monomer represented by following Formula 1:

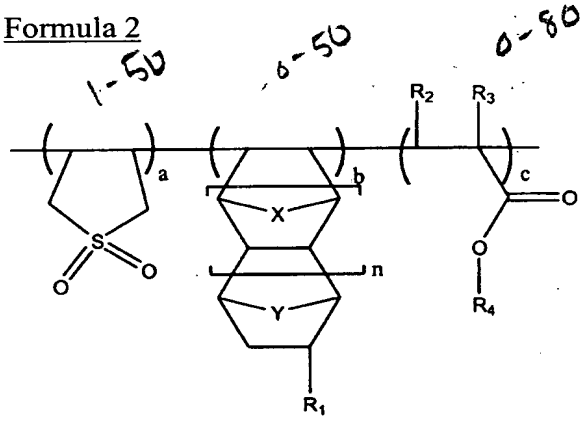
Formula 1



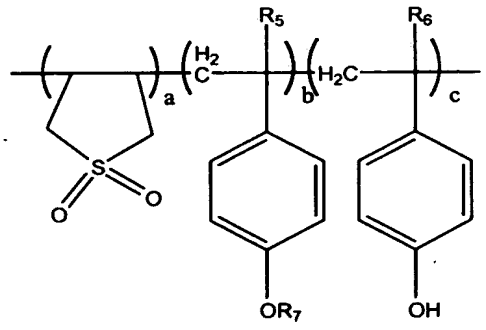
2. A photoresist polymer comprising the photoresist monomer of claim 1.

3. The photoresist polymer according to claim 2, wherein the polymer comprises a repeating unit of Formula 2 or Formula 3:

Formula 2



Formula 3



wherein R_1 is selected from the group consisting of H, halogen, (C_1-C_{20}) alkyl, (C_1-C_{20}) alkyl with halogen substituent(s), (C_1-C_{20}) alkyl containing an ether group (-O-), (C_1-C_{20}) alkyl with halogen substituent(s) and containing an ether group, and -COOR';

R_2, R_3, R_5 and R_6 are individually selected from the group consisting of H, halogen, (C_1-C_{20}) alkyl, (C_1-C_{20}) alkyl with halogen substituent(s), (C_1-C_{20}) alkyl containing an ether group, and (C_1-C_{20}) alkyl with halogen substituent(s) and containing an ether group;

R', R_4 and R_7 are individually acid labile protecting groups;

X and Y are individually selected from the group consisting of (C_1-C_{10}) alkylene, O and S;

n is 0 or 1; and

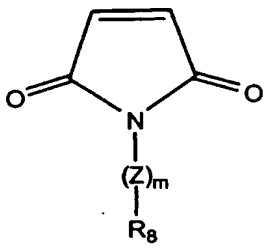
the ratio a : b : c falls within the ranges 1-50mol% : 0-50mol% : 0-80mol%.

4. The photoresist polymer according to claim 3, wherein the repeating unit comprises one or more of substituent(s) which are selected from the group consisting of halogen, (C_1-C_{20}) alkyl, (C_1-C_{20}) alkyl with halogen substituent(s), (C_1-C_{20}) alkyl containing an ether group, and (C_1-C_{20}) alkyl with halogen substituent(s) and containing an ether group.

5. The photoresist polymer according to claim 3, wherein the acid labile protecting group is selected from the group consisting of 2-methyl 2-adamantyl, hexafluoro isopropyl, 8-ethyl 8-tricyclodecanyl, tert-butyl, tetrahydropyran-2-yl, 2-methyl tetrahydropyran-2-yl, tetrahydrofuran-2-yl, 2-methyl tetrahydrofuran-2-yl, 1-methoxypropyl, 1-methoxy-1-methylethyl, 1-ethoxypropyl, 1-ethoxy-1-methylethyl, 1-methoxyethyl, 1-ethoxyethyl, tert-butoxyethyl, 1-isobutoxyethyl and 2-acetylmenth-1-yl.

6. The photoresist polymer according to claim 3, wherein the repeating unit further comprises a monomer of Formula 4.

Formula 4



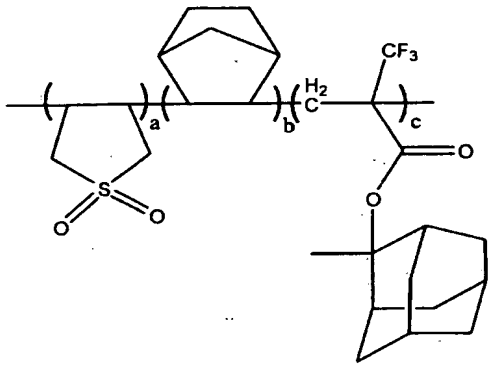
wherein, R_8 is selected from the group consisting of H, halogen, (C_1-C_{20}) alkyl, (C_1-C_{20}) alkyl with halogen substituent(s), (C_1-C_{20}) alkyl containing an ether group, and (C_1-C_{20}) alkyl with halogen substituent(s) and containing an ether group;

Z is O or S; and

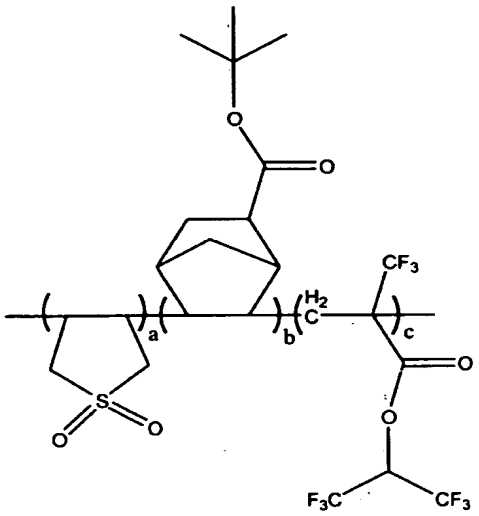
m is 0 or 1.

7. The photoresist polymer according to claim 3 or claim 6, wherein the repeating unit is represented by Formulas 2a to 2d or Formula 3a:

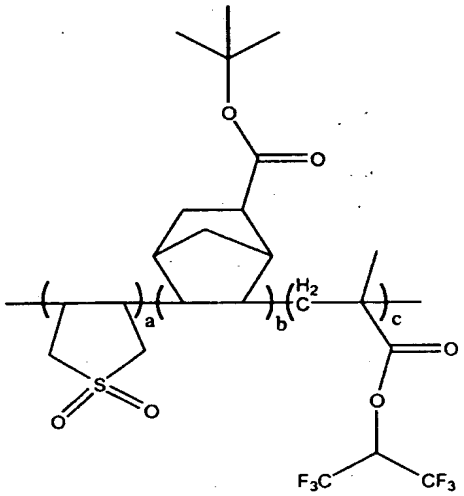
Formula 2a



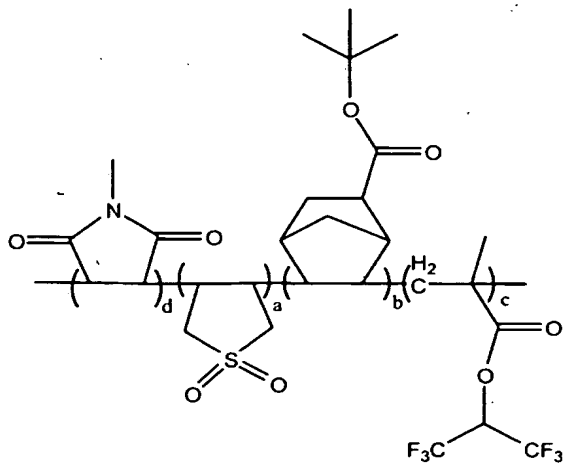
Formula 2b



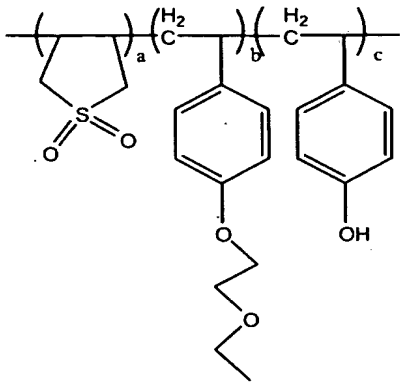
Formula 2c



Formula 2d



Formula 3a

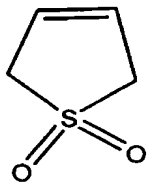


8. A process of preparing of a photoresist polymer comprising:

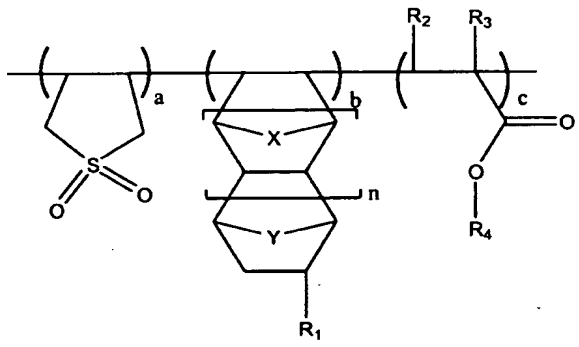
(a) admixing (i) a monomer of Formula 1, (ii) at least one of the monomer selected from the group consisting of Formula 5 and Formula 6, and with or without (iii) a monomer of Formula 4; and

(b) adding a radical polymerization initiator or an anion polymerization catalyst into the resultant of step (a) to obtain a repeating unit of Formula 2.

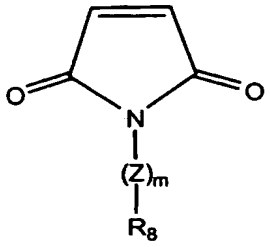
Formula 1



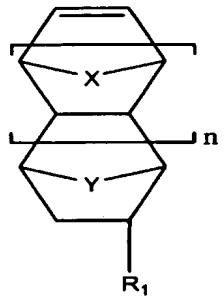
Formula 2



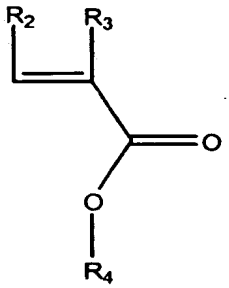
Formula 4



Formula 5



Formula 6



wherein, R_1 is selected from the group consisting of H, halogen, (C_1-C_{20}) alkyl, (C_1-C_{20}) alkyl with halogen substituent(s), (C_1-C_{20}) alkyl containing an ether group, (C_1-C_{20}) alkyl with halogen substituent(s) and containing an ether group, and -COOR';

R_2, R_3 and R_8 are individually selected from the group consisting of H, halogen, (C_1-C_{20}) alkyl, (C_1-C_{20}) alkyl with halogen substituent(s), (C_1-C_{20}) alkyl containing an ether group, and (C_1-C_{20}) alkyl with halogen substituent(s) and containing an ether group;

R' and R_4 are individually acid labile protecting groups;

X and Y are individually selected from the group consisting of (C_1-C_{10}) alkylene, O and S;

Z represents O or S;

m and n are individually 0 or 1; and

the ratio a : b : c falls within the ranges 1-50mol% : 0-50mol% : 0-80mol%.

9. The process according to claim 8, wherein the step (b) is carried out in a polymerization solvent selected from the group consisting of cyclohexanone, cyclopentanone, tetrahydrofuran, dimethylformamide, dimethylsulfoxide, dioxane, methylethylketone, benzene, toluene, xylene and mixtures thereof.

10. The process according to claim 8, wherein the radical polymerization initiator is selected from the group consisting of 2,2'-azobisisobutyronitrile(AIBN), benzoylperoxide, acetylperoxide, laurylperoxide, tert-butylperoxide and di-tert-butyl peroxide.

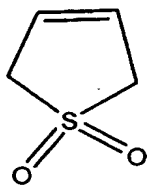
11. The process according to claim 8, wherein the anion polymerization catalyst is selected from the group consisting of KOH, $NaNH_2$, alkoxide ion, alkali metal, grignard reagent and alkyl lithium.

12. A process of preparing of a photoresist polymer comprising:

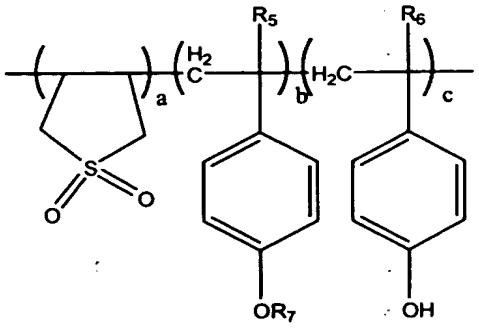
(a) admixing (i) a monomer of Formula 1, (ii) at least one of the monomer selected from the group consisting of Formula 7 and Formula 8, and with or without (iii) a monomer of Formula 4; and

(b) adding a radical polymerization initiator or an anion polymerization catalyst into the resultant of step (a) to obtain a repeating unit of Formula 3.

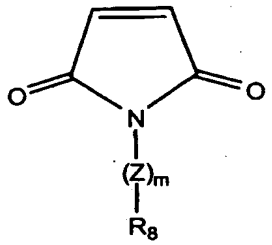
Formula 1



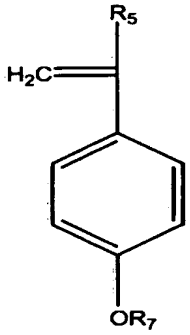
Formula 3



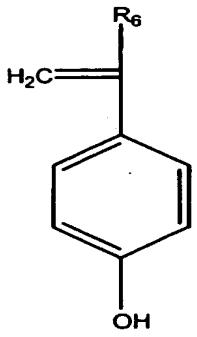
Formula 4



Formula 7



Formula 8



wherein, R_1 is selected from the group consisting of H, halogen, (C_1-C_{20}) alkyl, (C_1-C_{20}) alkyl with halogen substituent(s), (C_1-C_{20}) alkyl containing an ether group, (C_1-C_{20}) alkyl with halogen substituent(s) and containing an ether group, and -COOR';

R_5, R_6 and R_8 are individually selected from the group consisting of H, halogen, (C_1-C_{20}) alkyl, (C_1-C_{20}) alkyl with halogen substituent(s), (C_1-C_{20}) alkyl containing an ether group, and (C_1-C_{20}) alkyl with halogen substituent(s) and containing an ether group;

R_7 is an acid labile protecting group;

Z represents O or S;

m is 0 or 1; and

the ratio a : b : c falls within the ranges 1-50mol% : 0-50mol% : 0-80mol%.

13. The process according to claim 12, wherein the step (b) is carried out in a polymerization solvent selected from the group consisting of cyclohexanone, cyclopentanone, tetrahydrofuran, dimethylformamide, dimethylsulfoxide, dioxane, methylethylketone, benzene, toluene, xylene and mixtures thereof.

14. The process according to claim 12, wherein the radical polymerization initiator is selected from the group consisting of 2,2'-azobisisobutyronitrile(AIBN), benzoylperoxide, acetylperoxide, laurylperoxide, tert-butylperoxide and di-tert-butyl peroxide.

15. The process according to claim 12, wherein the anion polymerization catalyst is selected from the group consisting of KOH, $NaNH_2$, alkoxide ion, alkali metal, grignard reagent and alkyl lithium.

16. A photoresist composition comprising:

(i) the photoresist polymer comprising the photoresist monomer of claim 1;

(ii) an organic solvent; and

(iii) a photoacid generator.

17. The photoresist composition according to claim 16, wherein the photoacid generator is selected from the group consisting of phthalimidotrifluoromethane sulfonate, dinitrobenzyltosylate, n-decyl disulfone and naphthylimido trifluoromethane sulfonate.

18. The photoresist composition according to claim 17, wherein the photoacid generator further comprises a compound selected from the group consisting of diphenyl iodide hexafluorophosphate, diphenyl iodide hexafluoroarsenate, diphenyl iodide hexafluoroantimonate, diphenyl p-methoxyphenylsulfonium triflate, diphenyl p-toluenylsulfonium triflate, diphenyl p-isobutylphenylsulfonium triflate, diphenyl p-tert-butylphenylsulfonium triflate, triphenylsulfonium hexafluororphosphate, triphenylsulfonium hexafluoroarsenate, triphenylsulfonium hexafluoroantimonate, triphenylsulfonium triflate, dibutylnaphthylsulfonium triflate and mixtures thereof.

19. The photoresist composition according to claim 16, wherein the photoacid generator is present in an amount ranging from about 0.05 to about 10% by weight of the photoresist polymer.

20. The photoresist composition according to claim 16, wherein the organic solvent is selected from the group consisting of methyl 3-methoxypropionate, ethyl 3-ethoxypropionate, propylene glycol methyl ether acetate, cyclohexanone, 2-heptanone, ethyl lactate and mixtures thereof.

21. The photoresist composition according to claim 16, wherein the organic solvent is present in an amount ranging from about 500 to about 2000% by weight of the photoresist polymer.

22. A process for forming a photoresist pattern, comprising:

(a) coating a photoresist composition of claim 16 on a substrate to form a photoresist film;

(b) exposing the photoresist film to light; and

(c) developing the exposed photoresist film to obtain a photoresist pattern.

23. The process according to claim 22, further comprising a soft baking step before step (b) and/or a post baking step after step (b).

24. The process according to claim 23, wherein the soft and post baking steps are individually performed at the temperature ranging from about 70 to about 200°C.

25. The process according to claim 22, wherein the source of the light is selected from the group consisting of VUV, ArF, KrF, E-beam, EUV and ion beam.

26. The process according to claim 22, wherein the irradiation energy of the step (b) ranges from about 1mJ/cm^2 to about 100 mJ/cm^2.

27. The process according to claim 22, wherein the step (c) is performed in alkaline developing solution.

28. A semiconductor element manufactured according to the process of claim 22.